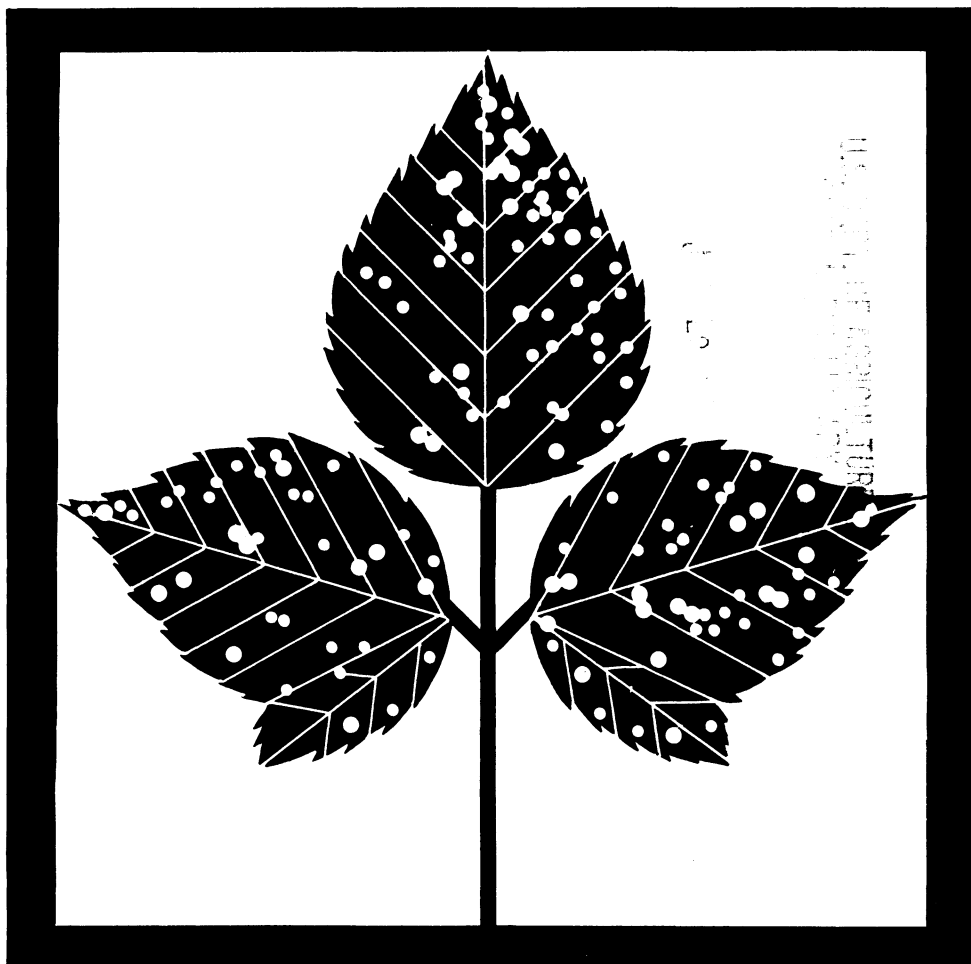


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Selection MS
Controlling
Diseases of Raspberries
and Blackberries



UNITED STATES
DEPARTMENT OF
AGRICULTURE

FARMERS'
BULLETIN
NUMBER 2208

PREPARED BY
SCIENCE AND
EDUCATION
ADMINISTRATION

Revised Oct 1978

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On January 24, 1978, four USDA agencies—Agricultural Research Service (ARS), Cooperative State Research Service (CSRS), Extension Service (ES), and the National Agricultural Library (NAL)—merged to become a new organization, the Science and Education Administration (SEA), U.S. Department of Agriculture.

This publication was prepared by the Science and Education Administration's Federal Research staff, which was formerly the Agricultural Research Service.

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Controlling Diseases of Raspberries and Blackberries

The most effective control measures for raspberry and blackberry diseases are those taken before the diseases become serious. Cultivars adapted to a locality and resistant to the major diseases should be planted, if available. Plants certified as being substantially disease free by a State plant inspection service should be used.

Cultural practices that promote vigorous growth are also important in growing healthy raspberries and blackberries.

RASPBERRY DISEASES

Mosaic

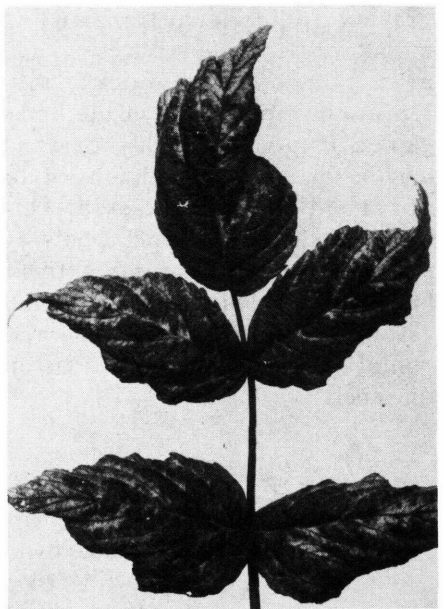
Raspberry mosaic, a virus disease widespread except on the Pacific coast, causes more severe damage on black and purple raspberries than on red raspberries.

Leaves on mosaic-infected canes show large, green blisters (fig. 1). Leaf tissue around the blisters turns yellowish. The leaves are abnormally small and sometimes deformed. Leaves that develop in hot weather show only faint symptoms or none at all.

Mosaic also causes progressive stunting of canes. New growth from mosaic-infected raspberries is shorter than growth of preceding seasons.

On black and purple raspberries, the tips of young canes may bend, turn black, and die.

Berries on badly infected canes are dry, seedy, or crumbly, and often worthless.



BN-22639

Figure 1.—Red raspberry leaves affected with mosaic. Curled leaves have large, green blisters.

Control.—If available, plant State-certified raspberries that have been found to be free from the mosaic viruses. Do not plant healthy raspberries near diseased plants. In areas like the Eastern United States where mosaic is common and spreads rapidly, do not plant red raspberries near black raspberries, even when both are disease free.

Remove and burn diseased raspberries; raspberries that leaf out late in spring are likely to be diseased. Certain leaf-feeding aphids spread mosaic rapidly.

Remove wild raspberries and blackberries from the vicinity of cultivated raspberries.

Parathion, diazinon, or malathion may be used to reduce the number of virus-carrying aphids on raspberries but will not protect plants from infection because insecticides on the plant do not act fast enough to prevent aphids from transmitting mosaic viruses. Follow directions and precautions on the insecticide label. Do not use parathion in the home garden. Parathion is highly toxic and may be fatal if swallowed, inhaled, or absorbed through the skin. This material should be applied only by persons who are familiar with its hazards and who will assume full responsibility for proper use and comply with all the precautions on the labels.

Leaf Curl

Raspberry leaf curl is a virus disease that occurs most frequently in the Mountain States and from Minnesota east into the New England States.

Leaves on canes infected with leaf curl are rounded and curled. Tissue

between veins of leaves is arched upward (fig. 2).

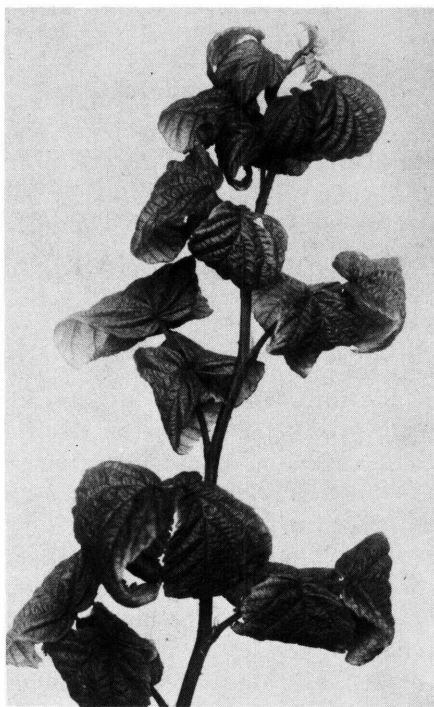
New canes are dwarfed and, each year, get shorter. The canes are yellowish at emergence, but they soon darken, become stiff and brittle, and frequently do not branch. As the disease progresses on black raspberries, canes will not bend to root at the tips.

Symptoms often appear on a single cane during a growing season and may not spread to other canes until the following season.

After a cane shows leaf symptoms, its fruit usually is worthless for marketing.

Leaf curl viruses are spread by certain small leaf-feeding aphids.

Control.—Use control measures recommended for raspberry mosaic.



BN-22634

Figure 2.—Leaf curl on red raspberry.

CAUTION

If pesticides are handled or applied improperly, or if unused parts are disposed of improperly, they may be injurious to humans, domestic animals, desirable plants, and pollinating insects, fish, or other wildlife, and may contaminate water supplies. Use pesticides only when needed and handle them with care. Follow the directions and heed all precautions on the container label.

Ringspot

Ringspot is a widespread virus disease that occurs in the major red raspberry-producing areas of the Pacific Coast and in the Northeastern United States.

In the spring a few leaves on recently infected red raspberry plants may show pale green rings that disappear as canes mature. Infected plants grow slower than normal, and become weak. Infected canes die back in the most susceptible cultivars or fruit may be crumbly in other cultivars. Certain cultivars show no noticeable damage when infected.

Ringspot in red raspberries is caused by tomato ringspot virus. Tomato ringspot virus occurs in many hosts, including weeds, and is spread through the soil by the dagger nematodes (Certain *Xiphinema* species).

Control.—Plant stock certified to be free from tomato ringspot virus on land that is free from *Xiphinema* species. See section on control of nematodes.

Anthracnose¹

Anthracnose is a fungus disease that causes severe damage on blackberries and black and purple raspberries throughout the United States. Although common on red raspberries, anthracnose does not seriously affect red raspberries.

Infected canes first show light-grayish spots about 1/8 inch in diameter. As the disease progresses, the spots enlarge and develop purple borders and ash-gray centers (fig. 3). Badly infected canes may be girdled or cracked.

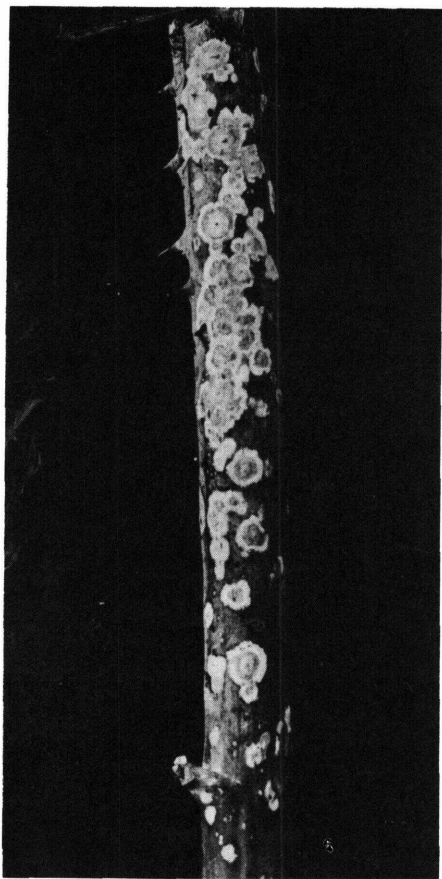
Anthracnose sometimes attacks the leaves of raspberries but it rarely defoliates the plants. Spots about 1/16 inch in diameter appear on infected leaves. The spots have light-gray centers and purple margins. Leaf tissue that is infected with anthracnose may drop out, causing holes in the leaves.

Berries on canes infected with anthracnose ripen abnormally and fruit stems frequently are girdled.

Control.—Choose a planting site that has good air drainage. Plant anthracnose-free raspberries. After planting black raspberries cut off the protruding canes (handles) at ground level.

Make two or three applications of fungicides as follows: For the first application, apply lime sulfur (1 part of active ingredient to 10 parts of water) in early spring when leaf buds begin to open and new leaves are exposed 1/2 to 3/4 inch.

¹Caused by *Elsinoe veneta*.



BN-22645

Figure 3.—Black raspberry cane showing symptoms of anthracnose. Spots have ash-gray centers and purple borders.

Make the second application when flower buds appear and new canes are about 6 inches high. If anthracnose is severe, make a third application after petals fall when new canes are 12 to 15 inches high.

Use captan at 1 pound, or ferbam at 1.5 pounds, of active ingredient per 100 gallons of water for the second and third applications.

Try to make fungicide applications before anticipated periods of rainy weather, and thoroughly cover the raspberries with fungicide.

After harvest, remove and burn fruiting canes and new canes that are badly infected.

Thin out healthy canes to allow good air drainage and keep rows free from weeds.

Remove wild raspberries and blackberries from fence rows and uncultivated land adjoining cultivated raspberries.

Cane Blight²

Cane blight is a widespread fungus disease that enters raspberry canes only through wounds in the canes. Pruning wounds are frequently attacked by cane blight.

Dark-brown cankers appear on wounds and extend down the cane or encircle it (fig. 4). Lateral shoots of infected fruiting canes wilt and die in warm weather. Infected canes turn grayish in summer.

Control.—If possible, prune raspberries at least 3 days before an anticipated rain. Remove and burn infected canes, and keep rows free from weeds.

Powdery Mildew³

Powdery mildew occurs on susceptible raspberries and blackberries wherever they are grown. Infected leaves may be covered with whitish mealy growth of the powdery mildew fungus causing twisting and dwarfing of the leaves, or the whitish mildew may not be apparent and the leaves may show mottled watersoaked spots. Infected shoot tips may become long and spindly (rattailed) and shoot growth can be dwarfed in

²Caused by *Leposphaeria coniothyrium*.

³Caused by *Sphaerotheca humuli*.



BN-22652

Figure 4.—Raspberry cane affected with cane blight. (Courtesy of Michigan Agricultural Experiment Station.)

severe cases. Fruit may occasionally be infected with the whitish powdery mildew growth. Latham and Puyallup red raspberry cultivars are very susceptible (fig. 5).

Control.—Use wide plant spacing to allow good air drainage so that plants can dry out fast after rain. Also avoid susceptible cultivars in fields where powdery mildew is a major problem. Use three to four applications of lime sulfur spray (10 gallons of liquid lime sulfur in 90 gallons of water) when leaves begin to

open in spring. Apply benomyl, 3/8 pound of active ingredient per acre, or dinocap, 3 ounces of active ingredient in 100 to 200 gallons of water at the onset of blossoming and at weekly intervals thereafter as needed but not closer than within 3 or 21 days of harvest, respectively. Wettable sulfur sprays (4 to 6 pounds in 100 gallons of water) may also be used to control powdery mildew when it appears, but both sulfur and dinocap sprays may burn the plants in hot weather.

Fruit Rots⁴

Fruit rots are widespread and develop fastest on overripe and bruised raspberries.

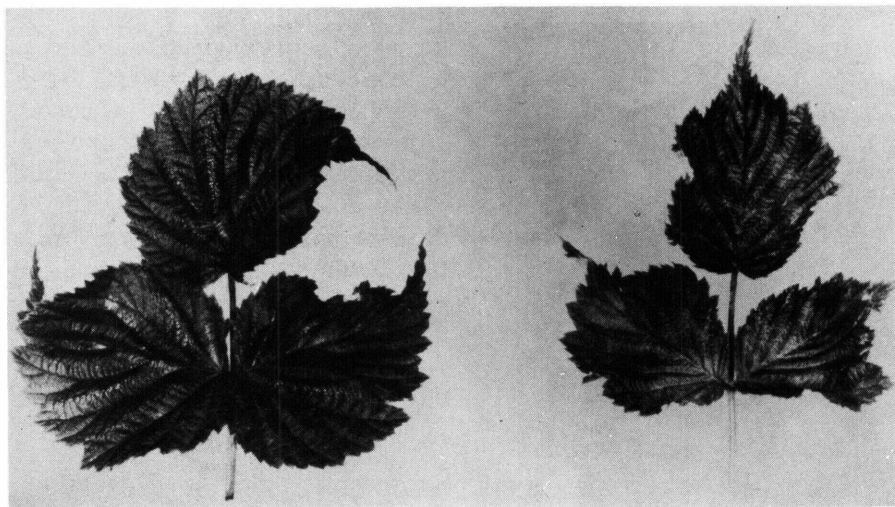
Warm, wet weather at harvest favors the development of fruit rots.

Gray mold fruit rot (fig. 6) is caused by *Botrytis cinerea* and is the most common fruit rot of raspberries and blackberries in the field.

Control.—Pick only sound, firm berries and handle them carefully to avoid bruising them. Pick raspberries early in the morning when they are cool.

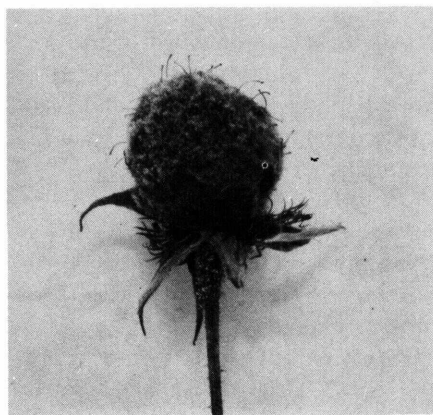
Store raspberries under refrigeration (32° to 40° F) or, if refrigeration is not available, in a place that is shady and well ventilated. Fungicide sprays aid in reducing fruit rots but are no substitute for frequent, thorough pickings and careful handling. Captan (1 pound of active ingredient per 100 gallons of water) may be used for this purpose during the period of fruit ripening and harvesting.

⁴Caused by *Alternaria* spp., *Penicillium* spp., *Cladosporium* spp., and *Botrytis cinerea*.



BN-26748

Figure 5.—Powdery mildew on red raspberry leaves. Note the light discolored areas and the curled margins. (After Fulton, 1960.)



BN-22643

Figure 6.—Gray mold fruit rot on red raspberry.

Leaf Spot⁵

Leaf spot is a fungus disease that attacks blackberries and raspberries throughout the United States, but it is most prevalent in the southeastern part of the country.

⁵Caused by *Sphaerulina rubi*.

Tiny greenish-black spots develop on the upper surfaces of infected leaves. As the leaves mature, the spots turn gray. Infected leaf tissue may drop out and cause holes in the leaves. Badly infected leaves fall prematurely.

Control.—Remove and burn fruiting canes after harvest. Thin out healthy canes to allow good air drainage, and keep rows free from weeds.

Apply sprays recommended for anthracnose.

Orange Rust⁶

Orange rust is a fungus disease that attacks blackberries and black and purple raspberries throughout the United States, but it is most common in the northeastern part of the country. Orange rust does not attack red raspberries.

⁶Caused by *Gymnoconia peckiana*.

After entering a plant, this organism spreads throughout the entire plant.

New canes that are infected with orange rust are weak and spindly, and they lack spines.

Infected leaves are abnormally small and yellowish. Blisterlike pustules, which shed reddish-orange spores, develop on the undersides of infected leaves (fig. 7).

Symptoms on upper leaves disappear toward the end of June, but

the canes are thoroughly infected and will not blossom the following year.

Control.—Plant rust-free raspberries. Remove and burn raspberries that show symptoms of orange rust in spring. Remove wild black raspberries and blackberries from the vicinity of cultivated raspberries.

Thin out healthy canes to allow good air drainage, and keep rows free from weeds. Fungicide sprays and pruning are ineffective for control of orange rust.



BN-22635

Figure 7.—Orange rust on black raspberry. Blisterlike pustules are on undersides of leaves.

Spur Blight⁷

Spur blight is a fungus disease that severely damages red raspberries in the northern part of the United States.

Brown or purple spots appear at buds along infected canes (fig. 8). Tissue around the buds darken and shrivel. Such canes fail to branch and, consequently, do not produce fruit. Buds near ground level are affected more than buds that develop higher on the canes.

Leaves on diseased fruiting canes fall prematurely; the canes dry out and may crack.

Control.—Apply sprays recommended for anthracnose, but delay first application 7 days. Make the second application when canes are 9 or 10 inches high; and 14 days later, make the third application.

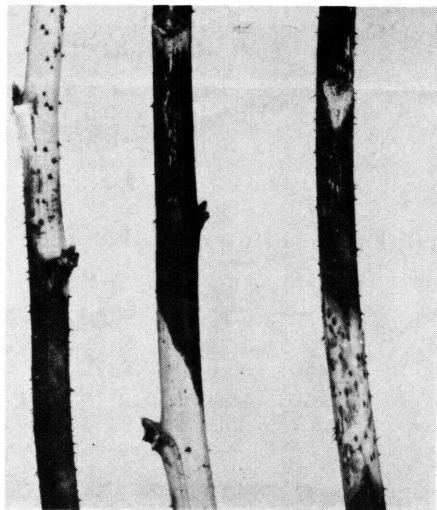
In early spring, remove and burn infected canes.

Verticillium Wilt⁸

Verticillium wilt of raspberries is a soil-borne fungus disease that is widespread in the northern half of the United States and along the Pacific coast. It is particularly damaging to black raspberries.

Leaves on infected fruiting canes (fig. 9) turn yellow, gradually wither, and fall. These symptoms begin on the lower leaves and continue up the canes until the canes turn blue and gradually die.

Control.—Plant wilt-free raspberries in clean soil. Rotate raspberries with other crops, but wait at



BN-22642

Figure 8.—Red raspberry canes showing spur blight. Infected tissue is brown or purple. (Courtesy of Michigan Agricultural Experiment Station.)

least 3 years before planting raspberries in soils that have grown potatoes, tomatoes, peppers, or eggplants. Remove and burn diseased plants. Foliage applications of fungicides are ineffective for control of Verticillium wilt.

Crown Gall⁹

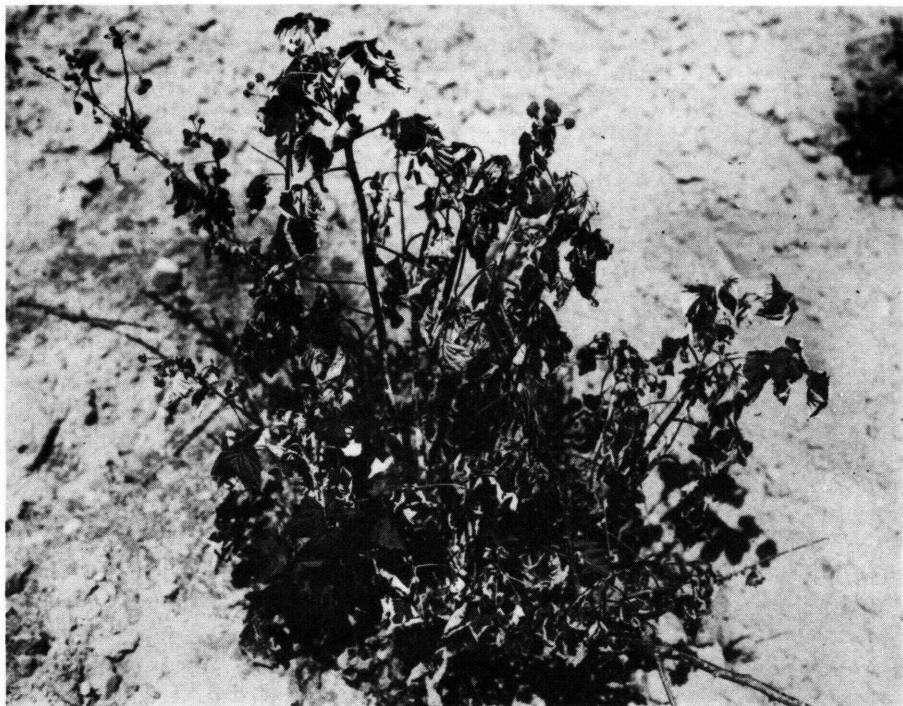
Crown gall, a bacterial disease of blackberries and raspberries, occurs throughout the United States.

On black and purple raspberries, wartlike growths first appear on canes of infected plants (fig. 10). As the galls enlarge, the diseased canes crack, dry out, and produce berries that are small and seedy. On infected red raspberries, wartlike growths occur just below the soil level on roots and on the crown.

⁷Caused by *Didymella applanata*.

⁸Caused by *Verticillium albo-atrum*.

⁹Caused by *Agrobacterium tumefaciens*.



BN-22637

Figure 9.—Black raspberry plant affected with *Verticillium* wilt. (Courtesy of Michigan Agricultural Experiment Station.)

Control.—Plant gall-free raspberries in clean soil. Wait 2 or 3 years before replanting raspberries in locations where gall occurred.

Dig up and burn diseased plants. Do not injure plants when cultivating.

Control.—Remove and burn blackberries that fail to set fruit; dig up roots to prevent new shoots from appearing. Plant only State-certified blackberries that were propagated from fruitful stock.

BLACKBERRY DISEASES

Sterility

Sterility is a symptom of a virus disease that occurs in all blackberry-growing areas of the United States. Infected blackberries usually grow more vigorously than healthy blackberries, but they either fail to set fruit or produce misshapen berries (fig. 11).

Anthracnose¹⁰

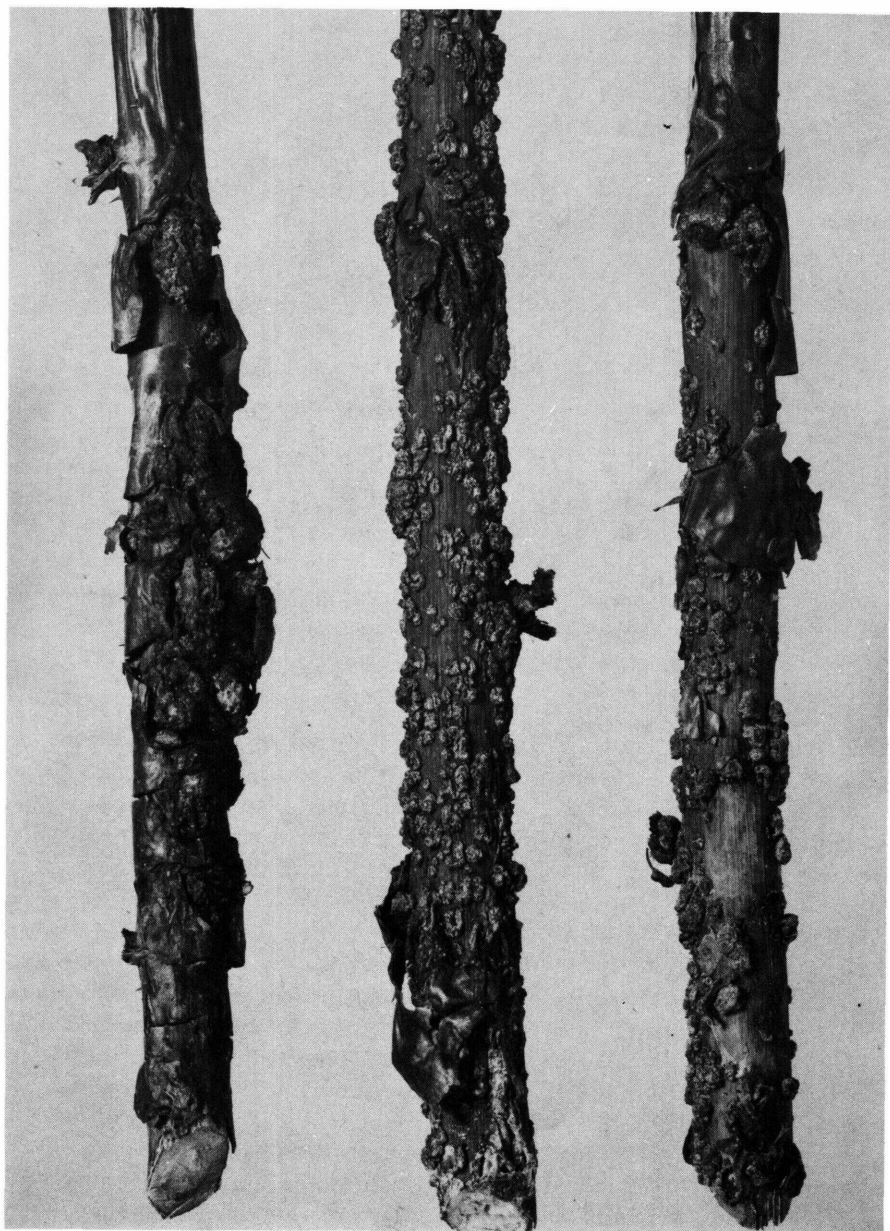
Anthracnose is a fungus disease that attacks both raspberries and blackberries throughout the United States, but on blackberries the disease is most severe in the southeastern part of the country.

Infected canes first show small purplish spots that are about 1/8 inch

¹⁰Caused by *Elsinoe veneta*.

in diameter. As the disease progresses, the spots enlarge and develop light-gray centers and brownish borders. Badly infected canes dry out and crack.

Infected leaves first show tiny purple spots. The spots gradually run together and turn white; the spotted tissue may drop out, causing holes in the leaves.



BN-22641

Figure 10.—Purple raspberry canes showing galls on the canes caused by crown gall bacteria.



BN-22638

Figure 11.—Blackberries at right are infected with sterility virus; those at left are normal.

Infected berries are abnormally small and scabby.

Control.—Use control measures recommended for anthracnose on raspberries.

Orange Rust¹¹

Orange rust, a fungus disease, is common on raspberries and blackberries throughout the United States.

Leaves of infected canes turn yellowish soon after they unfold in spring. As the disease progresses, undersides of the leaves show orange blisterlike pustules, which release spores.

Infected canes are spindly and clustered. Young canes that are diseased may appear to recover in

late July or in early August when their upper leaves do not show rust symptoms. The canes are still diseased, however, and will not bear fruit the following year.

Control.—Plant rust-free blackberries; do not propagate cuttings from diseased plants.

Remove wild blackberries and wild black raspberries from the vicinity of cultivated blackberries.

Remove blackberries that show symptoms of orange rust; dig up roots to prevent new shoots from appearing. However, if rust symptoms appear in late August or September, do not remove the plants, because the symptoms are caused by relatively harmless leaf rusts that commonly develop on old blackberry leaves.

¹¹Caused by *Gymnoconia peckiana*.

Rosette¹²

Rosette, or double blossom, is a fungus disease that attacks blackberries mainly from New Jersey to

¹²Caused by *Cercospora rubi*.

Illinois and southward. Short, broomlike growths emerge along infected canes (fig. 12). Flower buds are larger, coarser, and redder than usual. Petals are wrinkled and twisted. Blossoms on infected canes fail to form fruit.

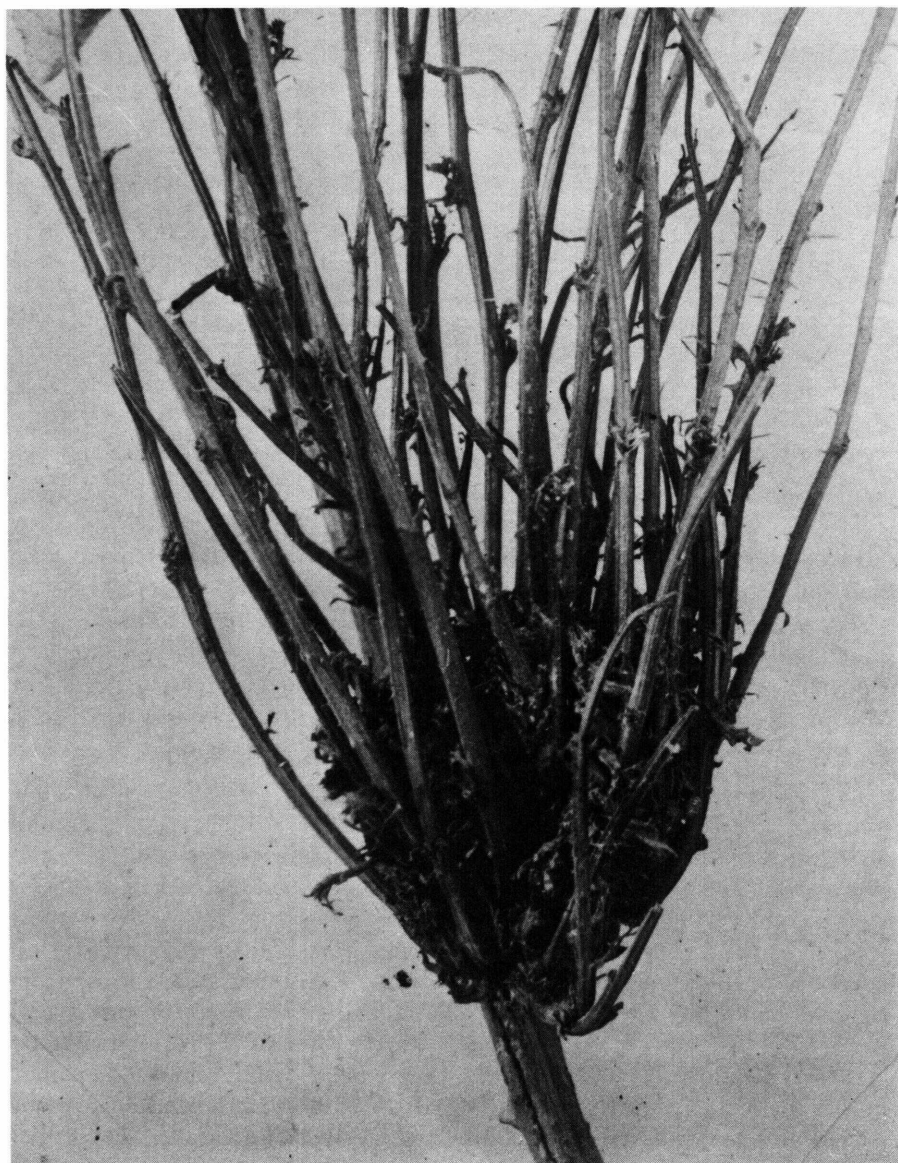


Figure 12.—Rosette on blackberry showing broomlike growths.

BN-22640

Control.—Remove wild blackberries from the vicinity of cultivated blackberries.

In Delaware and regions southward, cut *all* canes close to the ground after harvest and burn them. In northern regions, cut *fruiting* canes close to the ground after harvest and burn them; handpick and burn infected blossoms in spring or make weekly applications of benomyl, 1/2 pound of active ingredient per 100 gallons of water during the flowering period, starting when the *infected* flowers open.

Leaf and Cane Spot¹³

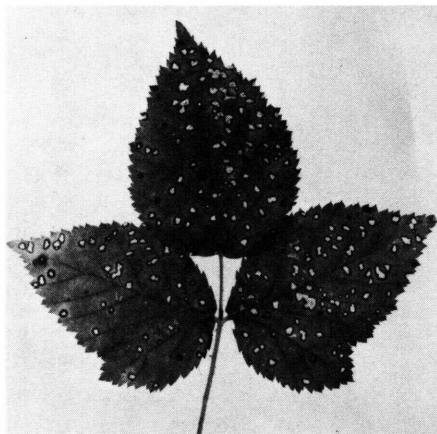
Leaf and cane spot, a fungus disease of raspberries and blackberries, is common in the Southeastern States and in the Pacific Northwest.

Spots with whitish centers and brown or purple borders show on infected leaves (fig. 13) and canes. If the disease is severe, leaves fall prematurely and canes suffer winter injury.

Control.—Remove and burn infected canes after harvest. In Southern States, apply sprays recommended for anthracnose on raspberries. In the Pacific Northwest, fall spraying for leaf and cane spot with bordeaux mixture (8-8-100) or fixed copper (4 pounds active ingredient plus 1 quart of superior type soil per 100 gallons of water) is recommended.

Crown Gall¹⁴

Crown gall, a bacterial disease of raspberries and blackberries, is



BN-22633

Figure 13.—Blackberry leaves showing leaf and cane spot. Spots have whitish centers and brown or purple borders.

distributed throughout the United States. It is responsible for large losses of salable nursery stock in both crops.

Wartlike growths (galls) appear on the roots and crowns of infected plants (fig. 14). Galls vary in size from that of a pinhead to several inches in diameter.

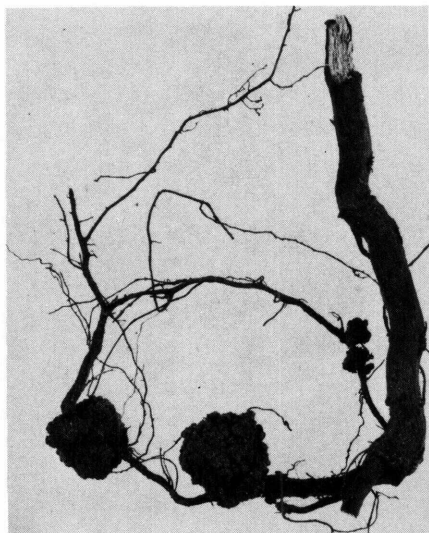
The above-ground parts of severely infected plants may be stunted. The disease organisms enter the plants only through wounds and growth cracks that are below ground level or slightly above it.

Control.—Plant gall-free raspberries and blackberries in clean soil. Wait 2 or 3 years before planting them in locations where crown gall occurred. Soils that have grown raspberries, blackberries, grapes, and tree fruits are likely to be infested with crown gall.

Dig up and burn diseased plants. Do not injure plants when cultivating.

¹³Caused by *Septoria rubi*.

¹⁴Caused by *Agrobacterium tumefaciens*.



BN-22632

Figure 14.—Blackberry roots showing crown galls.

NEMATODES

Raspberries and blackberries are subject to attack by a number of nematode species. The most damaging types are root-lesion (*Pratylenchus* spp.) and dagger (*Xiphinema* spp.) nematodes. Pin (*Paratylenchus* spp.) nematodes often occur in raspberry and blackberry plantings in high populations but good evaluations of the damage they actually cause are lacking.

Other nematodes found in raspberries and blackberries that may be locally important are root-knot (*Meloidogyne* spp.), spiral (*Helicotylenchus* spp.), and ring (*Cryconemoides* spp.) nematodes. Nematode attacks on plant roots often increase the severity of other soil-borne plant diseases, especially root rots and Verticillium wilt.

Nematode damage is indicated by spindly stands, small canes, and reduced fruit size and yields. The root systems of severely injured plants will often have galls and be rotted, matted, or reduced in quantity, particularly the smaller roots. The foliage may turn yellow and early leaf drop may occur especially during dry weather.

Control.—Clean nursery stock and clean soil are the basic requirements for nematode control in raspberries and blackberries. Resistant cultivars are unavailable and satisfactory rotation programs have not been developed. Chemical control of nematodes infecting established plantings is useful only in certain regions of the country.

Fields to be used for raspberry or blackberry nursery propagation should be tested for the presence of harmful nematodes before planting. Usually your county agricultural agent can arrange for such tests. The ground should be fumigated if these tests show a sufficient number of harmful nematodes.

Chemical treatments for the control of nematodes are best applied to the soil by injection. You may use dichloropropene, methyl bromide, dichloropropane-dichloropene mixtures, or formulations containing these mixtures and other soil pesticides such as chloropicrin and methyl isothiocyanate. Treatments are best made in warm, moist, well-cultivated soil.

You should allow at least one month to elapse between the time of fumigation and transplanting. Only the highest quality plants known to be free from nematodes, viruses,

diseases, and insect pests should be used for nursery plantings.

The rates of application of these chemicals vary depending on types of formulations, uses, and methods of

application. For specific materials and dosage recommendations for your area, contact your county agricultural agent and follow manufacturers' label directions.

USE OF PESTICIDES

This publication is intended for nationwide distribution. Pesticides are registered by the Environmental Protection Agency (EPA) for countrywide use unless otherwise indicated on the label.

This use of pesticides is governed by the provisions of the Federal Insecticide, Fungicide, and Rodenticide Act, as amended. This act is administered by EPA. According to the provisions of the act, "It shall be unlawful for any person to use any registered pesticide in a manner inconsistent with its labeling." (Section 12 (a) (2) (G))

EPA has interpreted this section of the act to require that the intended use of the pesticide must be on the label of the pesticide being used or covered by a Pesticide Enforcement Policy Statement (PEPS) issued by EPA.

The optimum use of pesticides, both as to rate and frequency, may vary in different sections of the country. Users of this publication may also wish to consult their Cooperative Extension Service, State agricultural experiment stations, or county extension agents for information applicable to their localities.

The pesticides mentioned in this publication are available in several

different formulations that contain varying amounts of active ingredient. Because of these differences, the rates given in this publication refer to the amount of active ingredient, unless otherwise indicated. Users are reminded to convert the rate in the publication to the strength of the pesticide actually being used. For example, 1 pound of active ingredient equals 2 pounds of a 50-percent formulation.

The user is cautioned to read and follow all directions and precautions given on the label of the pesticide formulation being used.

Federal and State regulations require registration numbers. Use only pesticides that carry one of these registration numbers.

USDA publications that contain suggestions for the use of pesticides are normally revised at 2-year intervals. If your copy is more than 2 years old, contact your Cooperative Extension Service to determine the latest pesticide recommendations.

The pesticides mentioned in this publication were federally registered for the use indicated as of the issue of this publication. The user is cautioned to determine the directions on the label or labeling prior to use of the pesticide.

☆ U.S. GOVERNMENT PRINTING OFFICE : 1978 O-275-692

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Stock No. 001-000-03873-7

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